TED 22 JUNE 65

June 10, 1965

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Monthly Progress Report No. 3
Contract [redacted]
Period - Month of May 1965

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1. PROGRESS ACCOMPLISHED

1.1. During this reporting period various photoconductive film forming techniques, and cell constructions were evaluated.

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1.1.1 Various grades of Zinc Oxide [redacted] Cadmium Sulfide [redacted] and Titanium Dioxide [redacted] were evaluated and found to be capable of alignment in varying degrees in an electric field. As anticipated the most promising compounds with respect to alignment were the acricular zinc oxides.

1.1.2 Ultra-violet sources of different light intensities were directed at VARAD typed cells containing ZnO, nitrocellulose and isoamyle acetate dispersions and pastes. No changes in alignment were observed.

1.1.3 Conductive glass electrodes separated by a thin film of ZnO, nitrocellulose and isoamyl acetate paste were prepared. Ultraviolet directed through this cell has no effect on the conductivity of the system as measured by a resistance change.

However, when a paste consisting of ZnO and isoamyl acetate <u>without nitrocellulose</u> was utilized in a conductive glass cell and exposed to visible light, a photoconductive effect was noted. A much larger effect of several magnitudes was noted on exposure to ultraviolet.

It appears that the use of nitrocellulose as a dispersant or binder for photoconductors inhibits their potential photoconductive capabilities.

1.1.4 A series of pastes containing ZnO, Toluene and Aroclor have been formulated. These have been evaluated as thin films in a conductive glass cell. It was found that when a suitable amount of Aroclor was substituted for nitrocellulose the photoconductive effect on exposure to ultraviolet light was observed.

1.2 Preliminary studies are being made to obtain uniform thin coatings of ZnO and Aroclor on conductive glass electrodes to obtain an optimum voltage divider effect.

1.2.1 We have observed a resistivity change up to 2000 to 1 with zinc oxide films. In order to use the zinc oxide in a voltage divider device, the dipole layer must be thin in relation to the thickness of the zinc oxide layer. However, the use of a zinc oxide layer so thick that the UV light will not penetrate through it will defeat the purpose of the voltage divider.

1.2.2 The zinc oxide coatings are being prepared by ball-milling various proportions of a meltable polymer such as aroclor and ZnO using toluene as a solvent.

a) We are determining the change of resistivity (light vs. dark) of the various ratios of ZnO/polymer melt solids.

b) Also being determined are the change in resistivity (light vs. dark) of zinc oxide layers of various thicknesses. If the change in resistivity is proportional to the thickness, the thickness of the zinc oxide layer is increased until the proportion decreases.

1.2.3 An attempt to verify the voltage divider effect was made with a wuickly put together cell and indications were that this approach has a good chance of success. We are presently constructing a cell (diagram attached) incorporating all the optimized conditions, in order to verify our first indications.

1.3 In addition to the above work, we are increasing our investigational effort into the photo-ionic effect and should have some indication by the next reporting period.

## 2. <u>DIFFICULTIES ENCOUNTERED</u>

2.1 No difficulties were encountered.

## 3. <u>FUTURE WORK</u>

3.1 Polymeric materials such as polystyrene and its copolymers will be studied as dispersants for $ZnO$.

3.2 Studies that have been initiated will be continued.

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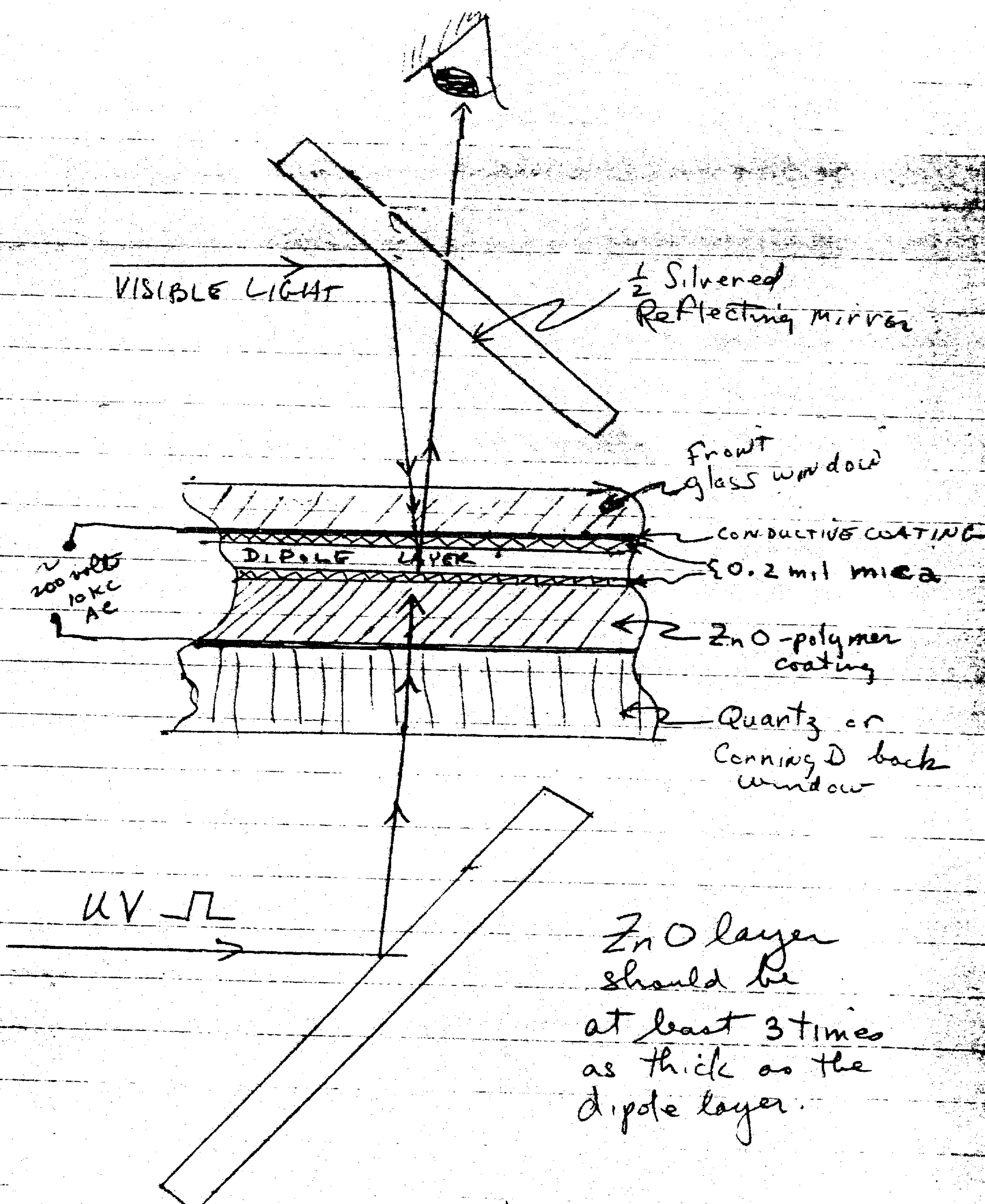


ZnO layer should be at least 3 times as thick as the dipole layer.

VOLTAGE DIVIDER CELL